

# **OPERATION MANUAL for Vacuum Assist Welding Chamber**

**Effective with Serial Number**

**82321**

## **IMPORTANT**

**Read this manual carefully before installing,  
commissioning or operating this product.**

**Revised May 1999**

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## **Vacuum Assist Welding Chamber**

## LIMITED WARRANTY

Jetline Engineering, Inc., of Irvine, California, U.S.A., warrants all new equipment to be free from defects in material and workmanship for the period of one (1) year, provided that the equipment is installed and operated according to instructions.

Jetline Engineering, Inc.'s obligation under this warranty is expressly limited to replacing or repairing any defective part or correcting any manufacturing defect without charge during the warranty period, if Jetline's inspection confirms the existence of such defects. Jetline's option of repair or replacement will be F.O.B. factory at Irvine, California, and therefore no compensation for transportation costs of any kind will be allowed.

The warranty period begins on the date of sale to the original-purchase user of the equipment.

Jetline Engineering, Inc. will not be liable for any loss or consequential damage or expense accruing directly or indirectly from the use of equipment covered by this warranty.

This warranty supersedes all previous Jetline warranties and is exclusive with no other guarantees or warranties expressed or implied.

## NOTICE

The installation, operation and maintenance guidelines set out in this manual will enable you to maintain the equipment in peak condition and achieve maximum efficiency with your welding operation. Please read these instructions carefully to become aware of every advantage.

## CAUTION

**Only experienced personnel familiar with the operation and safe practice of welding equipment should install and/or use this equipment.**

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## Section I

### Safety Precautions

#### WARNING

#### A. Arc Welding

**Arc Welding can be hazardous. Protect yourself and others from possible serious injury or death. Keep children away. Pacemaker wearers keep away until consulting your doctor.**

In welding, as in most jobs, exposure to certain hazards occurs. Welding is safe when precautions are taken. The safety information given below is only a summary of the more complete safety information that will be found in the Safety Standards listed at the end of this section. Read and follow all Safety Standards.

Have all installation, operation, maintenance and repair work performed only by qualified people.

#### B. Electric Shock

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. When using mechanized wire feed, the wire, wire reel, drive roll housing and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and appropriate body protection.
3. Disconnect input power before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
4. Properly install and ground this equipment according to the operation manual and national, state and local codes.
5. Always verify the supply ground-check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
6. When making input connections, attach proper grounding conductor first - double-check connections.
7. Frequently inspect input power cord for damage or bare wiring. Replace cord immediately if damaged - bare wiring can kill.
8. Turn off all equipment when not in use.
9. If earth grounding of the workpiece is required, ground it directly with a separate cable - do not use work clamp or work cable.
10. Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
11. Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
12. Wear a safety harness if working above floor level.

## **Vacuum Assist Welding Chamber**

13. Keep all panels and covers securely in place.
14. Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.

## **C. Arc Rays**

Arc rays can burn eyes and skin; noise can damage hearing; flying slag or sparks can injure eyes.

Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Noise from some processes can damage hearing. Chipping, grinding and weld cooling throw off pieces of metal or slag.

1. Use approved ear plugs or ear muffs if noise level is high.
2. Use a welding helmet fitted with a proper shade of filter to protect your face and eyes when welding or watching.
3. Wear approved safety glasses with side shields.
4. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
5. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection where necessary.

## **D. Fumes and Gases**

Fumes and gases can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.

2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDS) and the manufacturer's instruction for metals, consumables, coatings, cleaners, and degreasers.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch person nearby.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

## **E. Cylinders**

### **Cylinders can explode if damaged.**

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, slag, open flames, sparks, and arcs.
2. Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.

## Vacuum Assist Welding Chamber

3. Keep cylinders away from any welding or other electrical circuits.
4. Never weld on a pressurized cylinder - explosion will result.
5. Use only correct shielding gas cylinders, regulators, hoses and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Do not weld on closed containers such as tanks, drums, or pipes, unless they are properly prepared according to AWSF4.1 (see safety Standards).
7. Connect work cable to the work as close to the welding area as practical to prevent welding current traveling long, possibly unknown paths and causing electric shock and fire hazards.
8. Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.

## G. Moving Parts

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.

## H. EMF Information

### Considerations About Welding and the Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-53 (Washington, DC: U.S. Government Printing Office, May 1989):

".... there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields can interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex.

## F. Welding

### Welding can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.

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Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the work place, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around the body.
4. Keep welding power source and cables as far away as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

### About Pacemakers:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

## I. Principal Safety Standards

### Reference as applicable

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402

National Electric Code, NFPA Standard 70 from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3

Sales Practices for Occupation and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018

Cutting and Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

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## Section II

### Introduction

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Jetline Engineering has developed a controlled atmosphere welding chamber which incorporates an added feature. This added feature is a vacuum evacuation system. The purpose of the vacuum is to decrease the initial purge time, greatly improve the system's state of dryness, and to minimize the cost of labor and inert gas consumption during initial and post purging. The installation, operation and trouble-shooting guidelines set out in this manual will enable you to achieve maximum efficiency with your welding operation. Please read these instructions carefully to become aware of every advantage.

## Section III

# Installation

The entire chamber and accessory parts are shipped within one large wooden crate. Remove all the walls and the top of the crate. Remove the bolts that hold the chamber legs to the skid. The entire chamber may be lifted with a fork lift. Place the forks under the tabletop, being careful not to damage the chamber well, the vacuum gage or the flow-meter assembly.

### A. Cleaning

The steel riser top surface was coated with a fine film of rust preventive prior to shipment. This rust preventive must be removed. Disengage all of the clamps and remove the dome. Lift the dome upwards by use of the finger lugs. Do not lift the dome and riser with the finger lugs.

To remove the rust preventative, use a keytone solvent, such as acetone or methyl ethylene keytone (MEK). Wipe the steel tabletop and the inside of the chamber well until very clean.

Wipe the inside surface of the plexiglass dome clean with the supplied plastic polish, Mequiars MGH-10. Use a soft lint free cloth. Do not use solvents on the dome as they will dissolve the acrylic material and cause serious smears.

### B. Electrical Power Connection

The motor is a 230/460 volt, 3 phase motor. The motor is connected for 460 volts when it leaves the factory. If you require the motor to operate on 230 volts, rewire the motor according to the wiring plate diagram and a starter assembly will have to be ordered from the factory. The starter part number for the VC-36 and VC-48 is PKZMO-10. The starter part number for the VC-60 and VC-72 is PKZMO-14.

Connect the power line from a disconnect to the motor starter box. Turn the switch on. The pump should be turning clockwise in the direction of the arrow on the motor. If not, interchange any two of the three wires to reverse the motor. Refer to the wiring information on the name plate of the motor.

## Section IV

# General Description

### A. Dome

The welding chamber is equipped with a plexiglass dome. The dome is removable for loading of weldments. The optical characteristics of the dome are very good, with no distortion to hamper visibility. The dome filters out all ultraviolet rays, protecting against eye burns. However, the dome does not guard against eye strain; a colored welding lens must be used when viewing the electric arc.

Do not over heat the dome. The dome should never exceed 125°F (52°C). If the dome is heated above 90°F (32°C), it is not recommended to pull a vacuum until the dome has cooled to room temperature.

If the chamber is not going to be used for a period of time, unclamp the clamps that hold the dome to the riser. Due to pressure changes, cracking of the dome can occur.

Clean the dome to remove finger prints. Remove foreign film with plastic polish. Jetline keeps a supply of Mirror Glaze MGH-10 for this purpose. Jetline also keeps a supply of Mirror Glaze M-1708 cleaner for removal of films and small scratches.

### B. Exhaust Valve

This valve is mounted on the top of the dome. It allows the contaminated atmosphere to exhaust as the (heavier than air) argon gas flows into the chamber.

### C. Riser

The welding chamber is equipped with a polished and painted steel riser. This riser has an upper flange and a lower flange, both of which are machined to accept an "O" ring seal. The lower flange seats onto the round steel table. The upper flange seats against the flange of the dome. The dome is clamped to the riser with clamps. The riser is clamped to the table with destaco clamps. The glove ports, as described below, are an integral part of the riser.

### D. Glove and Ports

Two glove ports are provided as standard equipment. More may be furnished upon special request. Each port is equipped with one accordion rubber sleeve and one replaceable rubber glove. Each port is also equipped with an aluminum port cover. During evacuation, it is necessary to clamp the covers over the ports to prevent the gloves from inflating.

Prior to evacuation and after the covers have been clamped in place, it is necessary to open the ball valve adjacent to the glove port. This valve allows vacuum on the inside of the gloves. With vacuum on both sides of the gloves, they remain in a neutral state. This practice is also necessary when purging under high pressures.

## Vacuum Assist Welding Chamber

### E. Tabletop Assembly

The chamber tabletop is a heavy steel plate that has been blanchard ground to assure a good sealing surface between it and the riser flange. The tabletop is supported by four steel pipe legs for maximum stability. A ground lug is provided in the place of one of the leg mount bolts. The chamber well, described below, is an integral part of the tabletop.

### F. Chamber Well

The purpose of this well is to contain and house gas, water and electrical feed through fittings. The well allows the fittings to be positioned below the surface of the steel table. This lessens the chance of accidental damage to the fittings. The well houses the following fittings:

1. Electrode cable and water return feed through fittings.
2. Water feed through fitting, torch inlet.
3. Inert gas feed through fitting, torch inlet.
4. Purge gas feed through fitting, chamber inlet including a gas inlet diffuser.
5. Two electrical feed through fittings for operation of additional equipment.
6. If plasma welding is the process to be used in the chamber, the fourth torch line will pass through one of the electrical feed through fittings.

### G. Vacuum Gage

A vacuum gage is provided to indicate absolute pressure from 0" HG to 30" HG.

### H. Inert Gas Purge Ball Valve

This valve is provided to introduce and terminate the gas flow into the chamber.

**CAUTION**

**Important: This valve must be closed prior to evacuation to prevent excessive gas loss and possible damage to the flowmeter and the regulator.**

### I. Vacuum Shut-Off Ball Valve

This valve is provided to shut off vacuum when the gage reaches 28" HG. After this valve has been closed, the pump must be turned off.

**CAUTION**

**Important: This valve must be closed prior to opening the inert gas purge ball valve.**

## **J. Flowmeter Assembly**

This unit is clamped to the leg of the tabletop closest to the chamber well and controls the rate of flow of the purge gas to the diffuser. Hose is provided from the flowmeter to the gas inlet diffuser and also to a single stage pressure regulator which is to be attached to the gas supply.

## **K. Needle Valve**

This valve is provided to draw off a sample of the atmosphere when using a gas analyzer. This valve is normally left closed during the operation of the chamber and must be closed during evacuation.

## **L. Vacuum Pump & Motor Assembly**

The vacuum pump and motor assembly is mounted on a platform underneath the tabletop. The motor is wired for 460 volts, 3 phase, 60 Hz. For maintenance and care of this unit refer to the supplied pump instruction manual.

## Section V

### Operation

#### A. Chamber Preparation

1. Prepare the chamber for welding
  - a) Remove the plexiglass dome by use of the finger lifting lugs and clean all the metal surfaces, tools, etc. with an acetone solvent. Use a lint free cloth. The acetone helps absorb and evaporate moisture as well as remove grease or other foreign residues.
  - b) Clean the plexiglass dome with a soft cloth using Mequiars mirror glaze MGH-10 polish.
  - c) Place the work in the chamber and put the dome on to the riser flange. Do not forget torch accessories, filler wire, sharpened tungsten electrodes, pliers and cutters.
2. Secure all clamps on the following areas:
  - a) Lower riser flange to the table
  - b) Upper riser flange to the dome
  - c) Glove port covers
3. Secure manual valves.
  - a) Open the glove port ball valves (see chamber drawing, item 7).
  - b) Connect the inert gas regulator to a cylinder of argon. This regulator must be set to 50 PSI (3.5 kg per sq cm). Connect the argon hose from the regulator to the flowmeter. If your source of argon is a bulk argon system piped throughout the plant, connect the argon hose to the piping system,

providing the pressure in the pipe line does not exceed 50 PSI (3.5 kg per sq cm).

- c) Open the inert gas regulator from the source.
  - d) Close the inert gas purging ball valve (see chamber drawing, item 10).
  - e) The system is now prepared for initial purging.
4. Initial purging consists of evacuating the chamber to a low vacuum, followed by a back-filling with inert gas.

#### B. Operation Procedure

1. Open the vacuum shut-off ball valve (see chamber drawing, item 11).
2. Turn on the motor starter switch; vacuum will commence at this time.
3. When the gage reads 27-28" HG, shut off the ball valve (see chamber drawing, item 11); turn off the motor starter switch (see chamber drawing, item 15).
4. Turn on the inert gas high flow needle valve (see chamber drawing, item 16). This valve is to remain in this position until the exhaust valve ball rises (see chamber drawing, item 2).
5. Close the inert gas high flow needle valve 3 to 5 minutes after the exhaust valve ball rises.
6. Set the flowmeter at 20 CFH.
7. Begin the procedure for testing gas quality with the J2B gas purity analyzer (optional equipment).

8. If the results are negative (40 PPM or worse) recycle the vacuum system or purge longer.

## **C. Welding**

Following evacuation, back-filling and gas analysis, the chamber is ready for welding.

1. Close the glove port ball valve (see chamber drawing, item 7).
2. Set the gas flow to 30 CFH argon.
3. Remove the port covers.
4. Insert hands into gloves and proceed with welding.

## Section VI

### Trouble Shooting

<u>Problem</u>	<u>Cause</u>	<u>Remedy</u>
Initial purge time is too long.	Insufficient volume of inert gas is flowing into chamber.	Check cylinder gauge for 50 PSI (3.5 kg/sq cm) pressure. Check by-pass valve on flowmeter to assure maximum purge flow.
	Purity of gas supply is incorrect.	Use 99.996% argon (or reactor grade helium).
Cannot obtain less than 20 PPM contaminants even though gas supply is 99.996% pure.	Chamber has small leak.	Back-fill with Freon and use Freon leak detector or test joints with soap suds.
	Water cooled torch has leak.	Test for minute leak.
	Rubber glove has pin hole leak.	Check/replace gloves.
	Dust particles in the chamber.	Check/clean chamber with acetone solvent.
	Asbestos or cotton gloves or rags.	Do not use these inside chamber.
	The following contaminant carriers could be the cause of the trouble: Rusty tooling, some aluminum alloys (aluminum is hydroscopic), an electric motor whose winding could have absorbed moisture, bearings or tooling using water soluble grease or oil.	

## Section VII

### Parts List

The following pages provide a detailed parts list of all the elements of the Vacuum Assist Welding Chamber. They are arranged so the parts list on the left hand page corresponds to the assembly illustrated on the right hand page. Item numbers shown in the parts list refer to those numbers contained in the balloon in the drawing. The quantities shown are the number of items used in that particular assembly.

Two columns are included in the list to show the spare parts which are recommended to be stocked by the user. The two levels can be defined as follows:

Level 1 These are the spares recommended for US domestic users whose use of the product does not exceed 2000 hours per year.

Level 2 These are the spares recommended for international use of the product or for US domestic users who will use the product in excess of 2000 hours per year.

The following parts lists are included in this manual. Their appropriate page numbers are listed:

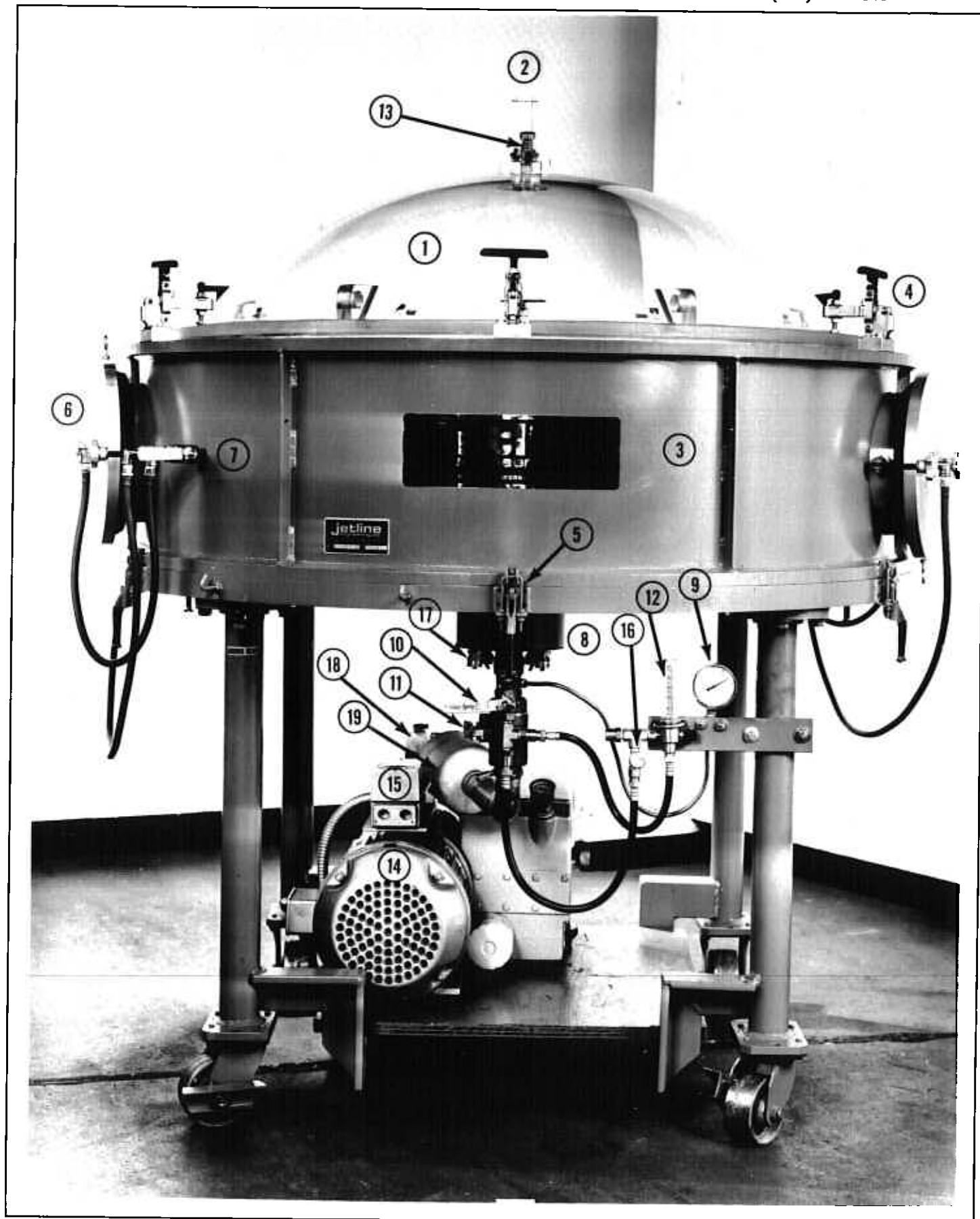
Vacuum Chamber .....	14/15
Glove Assembly .....	16/17
Pump Plumbing .....	18/19
Glove Port Cover Assembly .....	20/21

# Vacuum Assist Welding Chamber

## VACUUM ASSIST WELDING CHAMBER

Item No.	Part No.	Description	Qty	Recommended Spares	
				Level I	Level II
1	730-___-1	Dome, vacuum .....	1		
2	WC-105	Exhaust valve .....	1		
3	730-___-2B	Riser assembly .....	1		
4	ADB-62131	Clamp .....	1		
	ADB-65420	Clamp spindle .....	1		
	.275DIA	O-Ring material for riser .....	1		
5	331	Destaco clamp .....	1		
6	730-5B	Glove port cover .....	4		
	VC-205	Port gasket .....	4		
7	70-101	Bronze ball valve .....	1		
9	AA-640	Vacuum gage .....	1		
10	70-101	Bronze ball valve .....	1		
11	70-106	Ball valve .....	1		
12	14600240	Flowmeter .....	1		
	SR450D-580	Victor regulator (inert) .....	1		
13	V454	Needle valve .....	1		
14	063-138	Model R5 vacuum pump (VC-36, VC-48) .....	1		
	100-138	Model R5 vacuum pump (VC-60, VC-72) .....	1		
15		Motor Starter .....	1		
16	V454	Needle valve .....	1		
17	WC-238	1/8-1/4 feed-through fitting .....	1		
	WC-237	1/4-3/8 feed-through fitting .....	1		
	WC-104	Gas inlet filter .....	1		
18	803	Vacuum hose 1 1/2 I.D. ....	1		
19	0345-50118-301	Trap .....	1		
	0391-F4156-301	Molecular sieve .....	1		

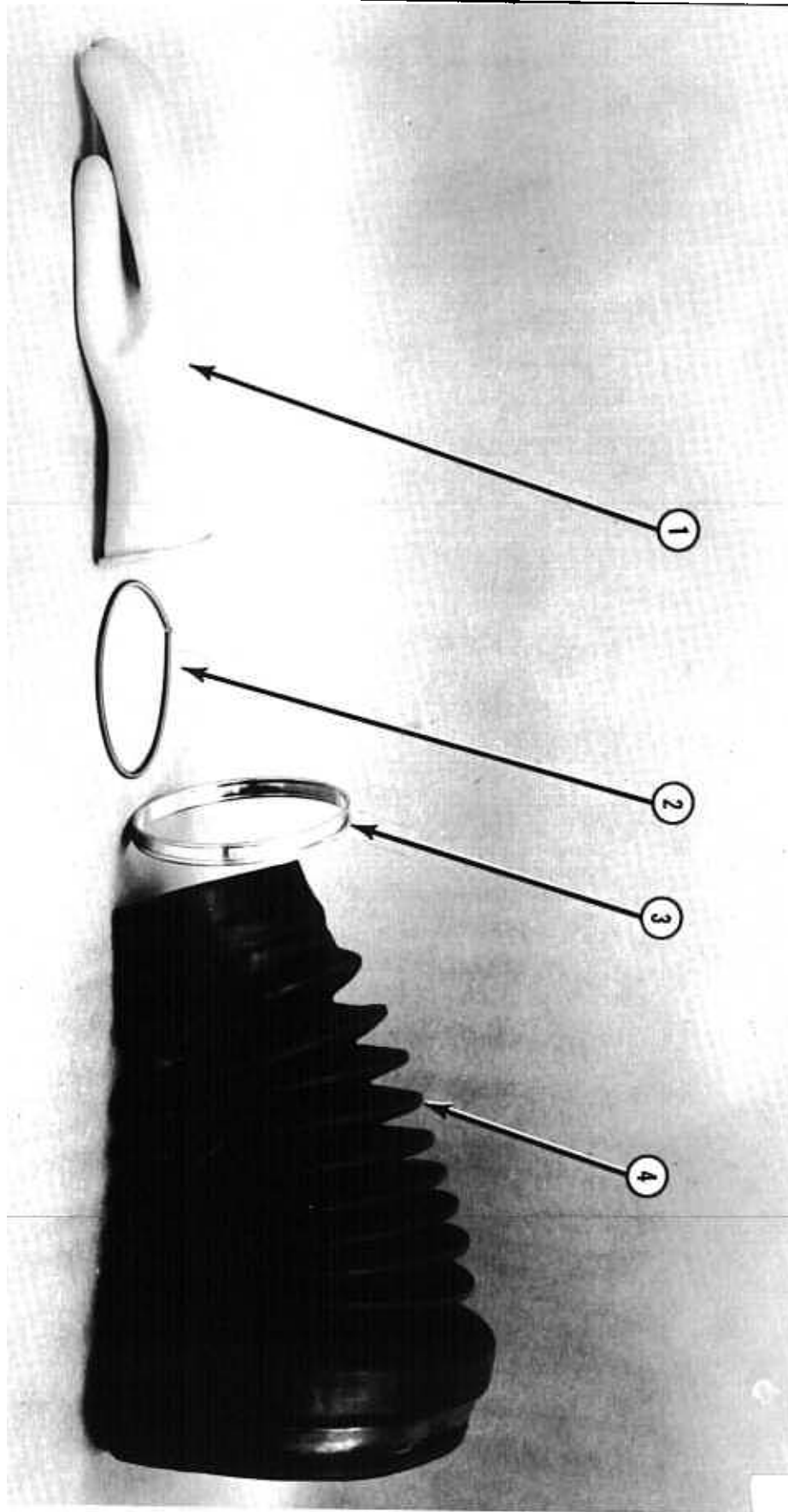
When ordering spare parts, state the model and serial number of your chamber. To order vacuum pump and motor replacement parts, refer to the supplied pump manual and parts list.



## Vacuum Assist Welding Chamber

### ACCORDION SLEEVE GLOVE ASSEMBLY

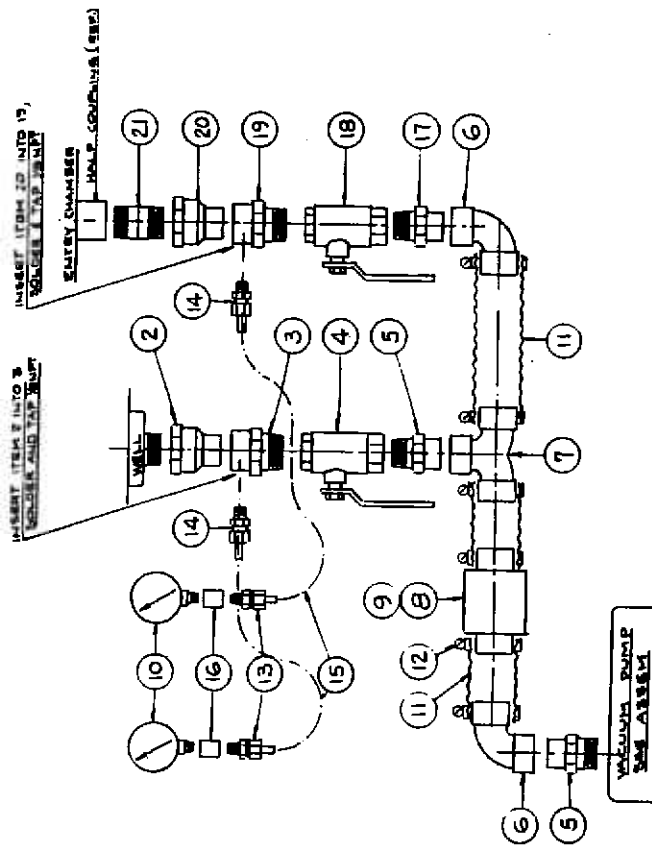
Item No.	Part No.	Description	Qty	Recommended Spares	
				Level I	Level II
1	R602-10	Hand .....	2 prs	2 prs	2 prs
2	R900	Spring .....	4	4	4
3	R800	Ring .....	4	4	4
4	R601	Sleeve, accordion .....	2 prs	1 pr	1 pr



# **Vacuum Assist Welding Chamber**

## **VACUUM PUMP PLUMBING & VACUUM PUMP PLUMBING WITH ENTRY CHAMBER**

Item No.	Part No.	Description	Qty	Recommended Spares	
				Level I	Level II
2	603-2 1¼"	Adapter Solder Joint .....	1		
3	604 1¼"	Adapter Solder Joint .....	1		
4	70-106	2-way Ball Valve .....	1		
5	604-2-1¼	Adapter Solder Joint .....	2		
6	607-1¼	90° Ell Solder Joint .....	2		
7	764-1¼	Double Ell Joint .....	1		
8	0345-X0118-301	Trap .....	1		
9	0391-F4156-301	Molecular Sieve .....	1		
10	AA-640	Vacuum Gage .....	2		
11	803	Vacuum Hose .....	3		
12		Worm Type Hose Clamp .....	6		
13	857-568	68 Male Coupling .....	2		
14	857-568	68 Male Coupling .....	2		
15		Tubing .....	2		
16	858-9422-8	Standard Mech. Coupling .....	2		
17	604-2	Adapter Solder Joint .....	1		
18	70-105	2-way Bronze Ball Valve .....	1		
19	604-1	Adapter Solder Joint .....	1		
20	603-2-1	1x1 Adapter Solder Joint .....	1		
21		Short Nipple .....	1		



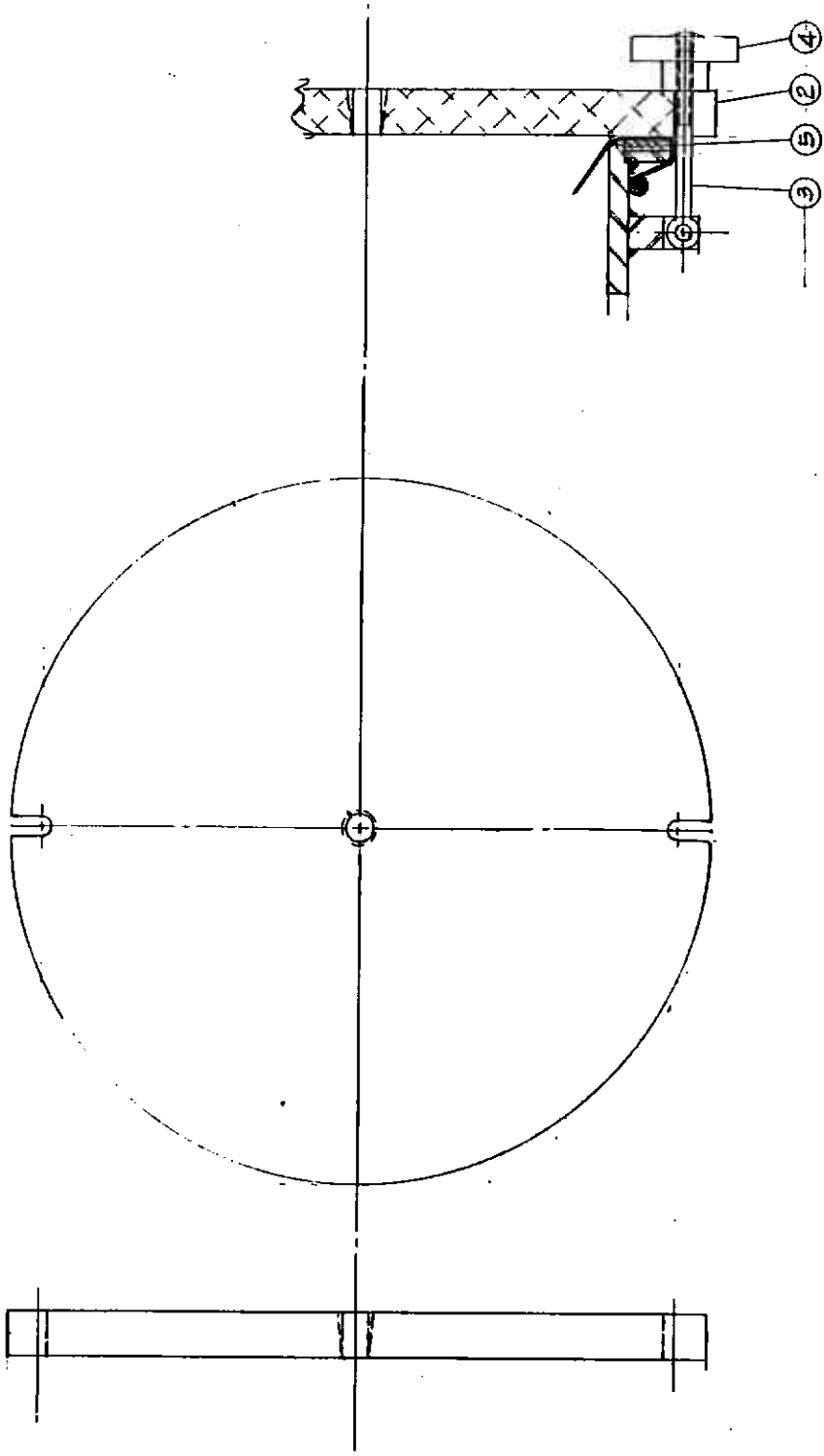
21	—	1	SHOOT WINDUP
20	603-2-1"	—	1-1 ADAPTER SHOOT JOINT
19	6041"	—	1-1 ADAPTER SHOOT JOINT
18	70-105	—	1-1 BALL VALVE 2-2 JOINT
17	604-2	—	1-1 ADAPTER SHOOT JOINT
16	958-422-8	1 2	STD HOSE COUPLING
15		1 2	TUBING
14	957-568	1 2	5/8 MALE COUPLING
13	957-568	1 2	5/8 MALE COUPLING
12		4 6	HOSE TYPE HOSE CLAMP
11	903	2 3	1/4 IN. 1/2 WACOM HOSE
10	AA-640	1 2	MEDIUM GRADE WACOM HOSE
9	201415-20	1 1	WACOM SAVE
8	036-4010020	1 1	POSSIBLE TAP
7	764-1A"	—	1/4 BOWMAN ALL SCREW JOINT
6	603-1A"	2 2	1/4 IN. 3/4 SCREW JOINT
5	604-2-1A"	2 2	1/4 ADAPTER SCREW JOINT
4	70-106	1 1	1/4 BALL VALVE 2-2 JOINT
3	604 1A"	1 1	1/4-1/4 JOINT SCREW JOINT
2	603-2 1A"	1 1	1/4-1/4 ADAPTER SCREW JOINT
1	NC-2015C	—	WAC PUMP W/ WACOM HOSE
1	VC-201	—	WACOM PUMP WACOM HOSE

[illegible]

## Vacuum Assist Welding Chamber

### GLOVE PORT COVER AND HARDWARE

Item No.	Part No.	Description	Qty	Recommended Spares	
				Level I	Level II
2	730-5B	Cover .....	1		
3	CL-26-EB	Eye Bolt .....	2	2	2
4	CL-1-HK-2	Hand Knob .....	2	2	2
5	VC-205	Port Gasket .....	1	2	2
6	M245	Clevis Pin .....	2	2	2



QTY	UNIT	DESCRIPTION
6	M24S	2 CLINCH-PIN
5	NC-205	1 PIST. GAUDET
4	CL-PIN-2	2 HAND. NUTS
3	CL-PIN-EB	2 KEY VOLT
2	730-5B	1 GAVIN R.
1		1 GAVIN

**Jetline**  
 1001 MILLER AVENUE, SUITE 100  
 GLOVE PORT, Belize & Honduras  
 TEL: 224-1111 FAX: 224-1111  
 730-5B